APPENDIX B:

CLEAN VERSION OF ALL PENDING CLAIMS AS NOW PRESENTED

Sub C1

17. (Three Times Amended) A method for establishing cryptographic communications, comprising the steps of:

encoding a plaintext message word M to a ciphertext word C, wherein M corresponds to a number representative of a message and wherein

$$0 \le M \le n-1,$$

wherein n is a composite number formed by the product of $p_1 \cdot p_2 \cdot \ldots \cdot p_k$, k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, C is a number representative of an encoded form of message word M, and wherein said encoding step comprises transforming said message word M to said ciphertext word C, whereby

$$C \equiv M^e \pmod{n},$$

and wherein e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1); and

decoding said ciphertext word C to a receive message word M', said decoding step being performed using a decryption exponent d that is defined by

$$d \equiv e^{-1} \bmod ((p_1-1)(p_2-1)\ldots(p_k-1)),$$

said decoding step including the further steps of,

defining a plurality of k sub-tasks in accordance with

$$M_1' \equiv C_1^{d_1} \pmod{p_1},$$

$$M_2' \equiv C_2^{d_2} \pmod{p_2},$$

$$\vdots$$

$$M_k' \equiv C_k^{d_k} \pmod{p_k},$$

wherein

$$C_1 \equiv C \pmod{p_1},$$

$$C_2 \equiv C \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv C \pmod{p_k},$$

$$d_1 \equiv d \pmod{(p_1 - 1)},$$

$$d_2 \equiv d \pmod{(p_2 - 1)}, \text{ and}$$

$$\vdots$$

$$d_k \equiv d \pmod{(p_k - 1)},$$

solving said sub-tasks to determine results M_1', M_2', ... M_k', and

combining said results of said sub-tasks to produce said receive message word M', wherein M'=M.

18. A method as recited in claim 17 wherein said step of combining said results of said sub-tasks includes a step of performing a recursive combining process to produce said receive message word M'.

19. A method as recited in claim 18 wherein said recursive combining process is performed in accordance with

$$Y_i \equiv Y_{i-1} + [(M_i' - Y_{i-1})\ (w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n,$$

wherein $2 \le i \le k$, and

$$M' = Y_k,\ Y_1 = M_1',\ \text{and}\ w_i = \prod_{j<i} p_j .$$

20. A method as recited in claim 17 wherein said step of combining said results of said sub-tasks includes a step of performing a summation process to produce said receive message word M'.

21. A method as recited in claim 20 wherein said summation process is performed in accordance with

$$M' \equiv \sum_{i=1}^{k} M_i' (w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

22. (Three Times Amended) A cyptographic communications system for establishing communications, comprising:

a communication medium;

encoding means coupled to said communication medium and adapted for transforming a transmit message word M to a ciphertext word C and for transmitting said ciphertext word C on said medium, wherein M corresponds to a number representative of a message, and

$0 \leq M \leq n-1$, wherein n is a composite number of the form,

$n = p_1 \cdot p_2 \cdot \ldots \cdot p_k$

wherein k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, and wherein said ciphertext word C corresponds to a number representative of an enciphered form of said message word M and corresponds to

$C \equiv M^e \pmod{n}$,

wherein e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1); and

decoding means communicatively coupled with said communication medium for receiving said ciphertext word C via said medium, said decoding means being operative to perform a decryption process for transforming said ciphertext word C to a receive message word M', wherein M' corresponds to a number representative of a deciphered form of C, said decryption process using a decryption exponent d that is defined by

$$d \equiv e^{-1} \bmod ((p_1-1)(p_2-1)\ldots(p_k-1)),$$

said decryption process including the steps of

defining a plurality of k sub-tasks in accordance with

$$M_1' \equiv C_1^{d_1} \pmod{p_1},$$

$$M_2' \equiv C_2^{d_2} \pmod{p_2},$$

$$\vdots$$

$$M_k' \equiv C_k^{d_k} \pmod{p_k},$$

wherein

$$C_1 \equiv C \pmod{p_1},$$

$$C_2 \equiv C \pmod{p_2},$$

$$\vdots$$

$C_k \equiv C \pmod{p_k}$,

$d_1 \equiv d \pmod{(p_1 - 1)}$,

$d_2 \equiv d \pmod{(p_2 - 1)}$,

$\vdots$

$d_k \equiv d \pmod{(p_k - 1)}$,

solving said sub-tasks to determine results M_1', M_2', ... M_k', and

combining said results of said sub-tasks to produce said receive message word M' whereby M'=M.

23. A cyptographic communications system as recited in claim 22 wherein said decoding means is operative to combine said results of said sub-tasks by performing a recursive combining process to produce said receive message word M'.

24. A cyptographic communications system as recited in claim 23 wherein said decoding means is operative to perform said recursive combining process in accordance with

$Y_i \equiv Y_{i-1} + [(M_i'-Y_{i-1}) (w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n$,

wherein $2 \leq i \leq k$, and

$M' = Y_k$, $Y_1 = M_1'$, and $w_i = \prod_{j<i} p_j$.

25. A cyptographic communications system as recited in claim 22 wherein said decoding means is operative combine said results of said sub-tasks by performing a summation process to produce said receive message word M'.

26. A cyptographic communications system as recited in claim 25 wherein said decoding means is operative to perform said summation process accordance with

$$M' \equiv \sum_{i=1}^{k} M_i' (w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

27. (Three Times Amended) A method for establishing cryptographic communications, comprising the step of:

encoding a plaintext message word M to a ciphertext word C, wherein M corresponds to a number representative of a message, and

$0 \leq M \leq n-1$,

n being a composite number formed from the product of $p_1 \cdot p_2 \cdot \ldots \cdot p_k$, wherein k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, and wherein the ciphertext word C is a number representative of an encoded form of message word M, wherein said step of encoding includes the steps of

defining a plurality of k sub-tasks in accordance with

$$C_1 \equiv M_1^{e_1} \pmod{p_1},$$

$$C_2 \equiv M_2^{e_2} \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv M_k^{e_k} \pmod{p_k},$$

where

$$M_1 \equiv M \pmod{p_1},$$

$$M_2 \equiv M \pmod{p_2},$$

$$\vdots$$

$$M_k \equiv M \pmod{p_k},$$

$$e_1 \equiv e \pmod{(p_1 - 1)},$$

$$e_2 \equiv e \pmod{(p_2 - 1)}, \text{ and}$$

$$\vdots$$

$$e_k \equiv e \pmod{(p_k - 1)},$$

wherein e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1),

solving said sub-tasks to determine results C_1, C_2, ... C_k, and

combining said results of said sub-tasks to produce said ciphertext word C.

28. A method as recited in claim 27 wherein said step of combining said results of said sub-tasks includes a step of performing a recursive combining process to produce said ciphertext word C.

29. A method as recited in claim 28 wherein said recursive combining process is performed in accordance with

$$Y_i \equiv Y_{i-1} + [(C_i - Y_{i-1})\,(w_i^{-1} \bmod p_i) \bmod p_i] \cdot w_i \bmod n,$$

wherein $2 \le i \le k$, and

$$C = Y_k,\ Y_1 = C_1,\ \text{and}\ w_i = \prod_{j<i} p_j .$$

30. A method as recited in claim 27 wherein said step of combining said results of said sub-tasks includes a step of performing a summation process to produce said ciphertext word C.

31. A method as recited in claim 30 wherein said summation process is performed in accordance with

$$C \equiv \sum_{i=1}^{k} C_i\,(w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

32. (Three Times Amended) A cyptographic communications system for establishing communications, comprising:

a communication medium;

encoding means coupled to said communication medium and operative to transform a transmit message word M to a ciphertext word C, and to transmit said ciphertext word C on said medium, wherein M corresponds to a number representative of a message, and

$0 \leq M \leq n-1$,

n being a composite number formed from the product of $p_1 \cdot p_2 \cdot \ldots \cdot p_k$ wherein k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$, are distinct random prime numbers, and wherein the ciphertext word C is a number representative of an encoded form of message word M, said encoding means being operative to transform said transmit message word M to said ciphertext word C by performing an encoding process comprising the steps of

defining a plurality of k sub-tasks in accordance with

$$C_1 \equiv M_1^{e_1} \pmod{p_1},$$

$$C_2 \equiv M_2^{e_2} \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv M_k^{e_k} \pmod{p_k},$$

where

$$M_1 \equiv M \pmod{p_1},$$

$$M_2 \equiv M \pmod{p_2},$$

$$\vdots$$

$$M_k \equiv M \pmod{p_k},$$

$$e_1 \equiv e \pmod{(p_1 - 1)},$$

$$e_2 \equiv e \pmod{(p_2 - 1)}, \text{ and}$$

$$\vdots$$

$$e_k \equiv e \pmod{(p_k - 1)},$$

wherein e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1),

solving said sub-tasks to determine results $C_1, C_2, \ldots C_k$, and

combining said results of said sub-tasks to produce said ciphertext word C.

33. A cyptographic communications system as recited in claim 32 wherein said encoding means is operative to combine said results of said sub-tasks by performing a recursive combining process to produce said ciphertext word C.

34. A cyptographic communications system as recited in claim 33 wherein said encoding means is operative to perform said recursive combining process in accordance with

$$Y_i \equiv Y_{i-1} + [(C_i - Y_{i-1})\ (w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n,$$

wherein $2 \leq i \leq k$, and

$$C = Y_k,\ Y_1 = C_1,\ \text{and}\ w_i = \prod_{j<i} p_j .$$

35. A cyptographic communications system as recited in claim 32 wherein said encoding means is operative to combine said results of said sub-tasks by performing a summation process to produce said message word C.

36. A cyptographic communications system as recited in claim 35 wherein said encoding means is operative to perform said summation process in accordance with

$$C \equiv \sum_{i=1}^{k} C_i\ (w_i^{-1} \bmod p_i) w_i \bmod n ,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

37. (Three Times Amended) A method for establishing cryptographic communications, comprising the steps of:

decoding a ciphertext word C to a message word M, wherein M corresponds to a number representative of a message and wherein

$$0 \leq M \leq n-1$$

wherein n is a composite number formed by the product of $p_1 \bullet p_2 \bullet \ldots \bullet p_k$, k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, C is a number representative of an

encoded form of message word M that is encoded by transforming said message word M to said ciphertext word C whereby

$$C \equiv M^e \pmod{n},$$

and wherein e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1);

said decoding step being performed using a decryption exponent d that is defined by

$$d \equiv e^{-1} \bmod ((p_1-1)(p_2-1)\ldots(p_k-1)),$$

wherein said step of decoding includes the steps of

defining a plurality of k sub-tasks in accordance with

$$M_1 \equiv C_1^{d_1} \pmod{p_1},$$

$$M_2 \equiv C_2^{d_2} \pmod{p_2},$$

$$\vdots$$

$$M_k \equiv C_k^{d_k} \pmod{p_k},$$

wherein

$$C_1 \equiv C \pmod{p_1},$$

$$C_2 \equiv C \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv C \pmod{p_k},$$

$$d_1 \equiv d \pmod{(p_1 - 1)},$$

$$d_2 \equiv d \pmod{(p_2 - 1)}, \text{ and}$$

$$\vdots$$

$$d_k \equiv d \pmod{(p_k - 1)},$$

solving said sub-tasks to determine results $M_1, M_2, \ldots M_k$, and

combining said results of said sub-tasks to produce said message word M.

38. A method as recited in claim 37 wherein said step of combining said results of said sub-tasks includes a step of performing a recursive combining process to produce said message word M.

39. A method as recited in claim 38 wherein said recursive combining process is performed in accordance with

$$Y_i \equiv Y_{i-1} + [(M_i - Y_{i-1})\,(w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n,$$

wherein $2 \leq i \leq k$, and

$$M' = Y_k,\ Y_1 = M_1',\ \text{and}\ w_i = \prod_{j<i} p_j .$$

40. A method as recited in claim 37 wherein said step of combining said results of said sub-tasks includes a step of performing a summation process to produce said message word M.

41. A method as recited in claim 40 wherein said summation process is performed in accordance with

$$M \equiv \sum_{i=1}^{k} M_i\,(w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

42. (Three Times Amended) A cyptographic communications system for establishing communications, comprising:

a communication medium;

decoding means communicatively coupled with said communication medium for receiving a ciphertext word C via said medium, and being operative to transform said ciphertext word C to a receive message word M', wherein a message M corresponds to a number representative of a message and wherein,

$0 \leq M \leq n\text{-}1$

wherein n is a composite number formed by the product of $p_1 \bullet p_2 \bullet \ldots \bullet p_k$, k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, and wherein said ciphertext word C is a number representative of an encoded form of said message word M that is encoded by transforming M to said ciphertext word C whereby,

$C \equiv M^e \pmod{n}$,

and wherein e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1);

said decoding means being operative to perform a decryption process using a decryption exponent d that is defined by

$$d \equiv e^{-1} \bmod ((p_1-1)(p_2-1)\ldots(p_k-1)),$$

said decryption process including the steps of

defining a plurality of k sub-tasks in accordance with,

$$M_1' \equiv C_1^{d_1} \pmod{p_1},$$

$$M_2' \equiv C_2^{d_2} \pmod{p_2},$$

$$\vdots$$

$$M_k' \equiv C_k^{d_k} \pmod{p_k},$$

wherein,

$$C_1 \equiv C \pmod{p_1},$$

$$C_2 \equiv C \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv C \pmod{p_k},$$

$$d_1 \equiv d \pmod{(p_1 - 1)},$$

$$d_2 \equiv d \pmod{(p_2 - 1)}, \text{ and}$$

$$\vdots$$

$$d_k \equiv d \pmod{(p_k - 1)},$$

solving said sub-tasks to determine results M_1', M_2', ... M_k', and

combining said results of said sub-tasks to produce said receive message word M', whereby M'=M.

43. A cyptographic communications system as recited in claim 42 wherein said decoding means is operative to combine said results of said sub-tasks by performing a recursive combining process to produce said receive message word M'.

44. A cyptographic communications system as recited in claim 41 wherein said decoding means is operative to perform said recursive combining process in accordance with

$$Y_i \equiv Y_{i-1} + [(M_i'-Y_{i-1})\ (w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n,$$

wherein $2 \leq i \leq k$, and

$$M = Y_k,\ Y_1 = M_1',\ \text{and}\ w_i = \prod_{j<i} p_j .$$

45. A cyptographic communications system as recited in claim 42 wherein said decoding means is operative to combine said results of said sub-tasks by performing a summation process to produce said receive message word M'.

46. A cyptographic communications system as recited in claim 45 wherein said decoding means is operative to perform said summation process in accordance with

$$M' \equiv \sum_{i=1}^{k} M_i'(w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

47. (Three Times Amended) A method for generating a digital signature, comprising the step of:

signing a plaintext message word M to create a signed ciphertext word C, wherein M corresponds to a number representative of a message, and

$0 \leq M \leq n-1$,

n being a composite number formed from the product of $p_1 \bullet p_2 \bullet \ldots \bullet p_k$, wherein k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, and wherein the signed ciphertext word C is a number representative of a signed form of message word M, wherein

$C \equiv M^d \pmod n$, and

wherein said step of signing includes the steps of

defining a plurality of k sub-tasks in accordance with

$$C_1 \equiv M_1^{d_1} \pmod{p_1},$$

$C_2 \equiv M_2^{d_2} \pmod{p_2}$,

$\vdots$

$C_k \equiv M_k^{d_k} \pmod{p_k}$,

where

$M_1 \equiv M \pmod{p_1}$,

$M_2 \equiv M \pmod{p_2}$,

$\vdots$

$M_k \equiv M \pmod{p_k}$,

$d_1 \equiv d \pmod{(p_1 - 1)}$,

$d_2 \equiv d \pmod{(p_2 - 1)}$, and

$\vdots$

$d_k \equiv d \pmod{(p_k - 1)}$,

wherein d is defined by

$d \equiv e^{-1} \bmod ((p_1 - 1) \cdot (p_2 - 1) \cdot \ldots \cdot (p_k - 1))$, and

e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1),

solving said sub-tasks to determine results $C_1, C_2, \ldots C_k$, and

combining said results of said sub-tasks to produce said ciphertext word C.

48. A method as recited in claim 47 wherein said step of combining said results of said sub-tasks includes a step of performing a recursive combining process to produce said ciphertext word C.

49. A method as recited in claim 48 wherein said recursive combining process is performed in accordance with

$Y_i \equiv Y_{i-1} + [(C_i - Y_{i-1}) (w_i^{-1} \bmod p_i) \bmod p_i] \cdot w_i \bmod n$,

wherein $2 \leq i \leq k$, and

$C = Y_k$, $Y_i = C_i$, and $w_i = \prod_{j<i} p_j$.

50. A method as recited in claim 47 wherein said step of combining said results of said sub-tasks includes a step of performing a summation process to produce said signed ciphertext word C.

51. A method as recited in claim 50 wherein said summation process is performed in accordance with

$$C \equiv \sum_{i=1}^{k} C_i (w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

52. (Three Times Amended) A digital signature generation system, comprising:

a communication medium;

digital signature generating means coupled to said communication medium and operative to transform a transmit message word M to a signed ciphertext word C, and to transmit said signed ciphertext word C on said medium, wherein M corresponds to a number representative of a message, and

$0 \leq M \leq n-1$,

n being a composite number formed from the product of $p_1 \cdot p_2 \cdot \ldots \cdot p_k$ wherein k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$, are distinct random prime numbers, and wherein the signed ciphertext word C is a number representative of a signed form of said message word M, wherein

$C \equiv M^d \pmod n$,

said digital signature generating means being operative to transform said transmit message word M to said signed ciphertext word C by performing a digital signature generating process comprising the steps of,

defining a plurality of k sub-tasks in accordance with,

$C_1 \equiv M_1^{d_1} \pmod{p_1}$,

$C_2 \equiv M_2^{d_2} \pmod{p_2}$,

$\vdots$

$C_k \equiv M_k^{d_k} \pmod{p_k}$,

where,

$M_1 \equiv M \pmod{p_1}$,

$M_2 \equiv M \pmod{p_2}$,

$\vdots$

$M_k \equiv M \pmod{p_k}$,

$d_1 \equiv d \pmod{(p_1 - 1)}$,

$d_2 \equiv d \pmod{(p_2 - 1)}$, and

$\vdots$

$d_k \equiv d \pmod{(p_k - 1)}$,

wherein d is defined by,

$d \equiv e^{-1} \bmod ((p_1 - 1) \cdot (p_2 - 1) \cdot \ldots \cdot (p_k - 1))$, and

e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1),

solving said sub-tasks to determine results $C_1, C_2, \ldots C_k$, and

combining said results of said sub-tasks to produce said signed ciphertext word C.

53. A digital signature generation system as recited in claim 52 wherein said signature generating means is operative to combine said results of said sub-tasks by performing a recursive combining process to produce said signed ciphertext word C.

54. A digital signature generation system as recited in claim 53 wherein said digital signature generating means is operative to perform said recursive combining process in accordance with

$Y_i \equiv Y_{i-1} + [(C_i - Y_{i-1}) (w_i^{-1} \bmod p_i) \bmod p_i] \cdot w_i \bmod n$,

wherein $2 \leq i \leq k$, and

$C = Y_k$, $Y_1 = C_1$, and $w_i = \prod_{j<i} p_j$.

55. A digital signature generation system as recited in claim 52 wherein said signature generating means is operative to combine said results of said sub-tasks by performing a summation process to produce said signed message word C.

56. A digital signature system as recited in claim 55 wherein said signature generating means is operative to perform said summation process in accordance with

$$C \equiv \sum_{i=1}^{k} C_i \, (w_i^{-1} \bmod p_i) w_i \bmod n ,$$

where

$w_i = \prod_{j \neq i} p_j$.

57. (Three Times Amended) A digital signature process, comprising the steps of:

signing a plaintext message word M to create a signed ciphertext word C, wherein M corresponds to a number representative of a message and wherein

$0 \leq M \leq n-1$

wherein n is a composite number formed by the product of $p_1 \cdot p_2 \cdot \ldots \cdot p_k$, k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, C is a number representative of a signed form of message word M, and wherein said encoding step comprises transforming said message word M to said ciphertext word C whereby,

$C \equiv M^d \pmod n$,

wherein d is defined by

$d \equiv e^{-1} \bmod ((p_1 - 1) \cdot (p_2 - 1) \cdot \ldots \cdot (p_k - 1))$, and

e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1); and

verifying said ciphertext word C to a receive message word M' by performing the steps of,

defining a plurality of k sub-tasks in accordance with

$$M_1' \equiv C_1^{e_1} \pmod{p_1},$$

$$M_2' \equiv C_2^{e_2} \pmod{p_2},$$

$$\vdots$$

$$M_k' \equiv C_k^{e_k} \pmod{p_k},$$

wherein

$$C_1 \equiv C \pmod{p_1},$$

$$C_2 \equiv C \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv C \pmod{p_k},$$

$$e_1 \equiv e \pmod{(p_1 - 1)},$$

$$e_2 \equiv e \pmod{(p_2 - 1)}, \text{ and}$$

$$\vdots$$

$$e_k \equiv e \pmod{(p_k - 1)},$$

solving said sub-tasks to determine results M_1', M_2', ... M_k', and

combining said results of said sub-tasks to produce said receive message word M', whereby M'=M.

58. A digital signature process as recited in claim 57 wherein said step of combining said results of said sub-tasks includes a step of performing a recursive combining process to produce said receive message word M'.

59. A digital signature process as recited in claim 58 wherein said recursive combining process is performed in accordance with

$$Y_i \equiv Y_{i-1} + [(M_i' - Y_{i-1}) (w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n,$$

wherein $2 \leq i \leq k$, and

$M' = Y_k$, $Y_i = M'_i$, and $w_i = \prod_{j<i} p_j$.

60. A digital signature process as recited in claim 58 wherein said step of combining said results of said sub-tasks includes a step of performing a summation process to produce said receive message word M'.

61. A digital signature process as recited in claim 60 wherein said summation process is performed in accordance with

$$M' \equiv \sum_{i=1}^{k} M'_i (w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

62. (Three Times Amended) A digital signature system, comprising:

a communication medium;

digital signature generating means coupled to said communication medium and adapted for transforming a message word M to a signed ciphertext word C and for transmitting said signed ciphertext word C on said medium, wherein M corresponds to a number representative of a message, and

$0 \leq M \leq n-1$, wherein n is a composite number of the form

$n = p_1 \cdot p_2 \cdot \ldots \cdot p_k$,

wherein k is an integer greater than 2 and $p_1, p_2, \ldots, p_k$ are distinct random prime numbers, and wherein said signed ciphertext word C corresponds to a number representative of a signed form of said message word M and corresponds to

$C \equiv M^d \pmod{n}$,

wherein d is defined by

$d \equiv e^{-1} \bmod ((p_1 - 1) \cdot (p_2 - 1) \cdot \ldots \cdot (p_k - 1))$, and

e is a number relatively prime to (p_1-1), (p_2-1), ..., and (p_k-1); and

digital signature verification means communicatively coupled with said communication medium for receiving said signed ciphertext word C via said medium, and being operative to verify said signed ciphertext word C by performing the steps of,

defining a plurality of k sub-tasks in accordance with

$$M_1' \equiv C_1^{e_1} \pmod{p_1},$$

$$M_2' \equiv C_2^{e_2} \pmod{p_2},$$

$$\vdots$$

$$M_k' \equiv C_k^{e_k} \pmod{p_k},$$

wherein

$$C_1 \equiv C \pmod{p_1},$$

$$C_2 \equiv C \pmod{p_2},$$

$$\vdots$$

$$C_k \equiv C \pmod{p_k},$$

$$e_1 \equiv e \pmod{(p_1 - 1)},$$

$$e_2 \equiv e \pmod{(p_2 - 1)},$$

$$\vdots$$

$$e_k \equiv e \pmod{(p_k - 1)},$$

solving said sub-tasks to determine results M_1', M_2', ... M_k', and

combining said results of said sub-tasks to produce said receive message word M' wherein M'=M.

63. A digital signature system as recited in claim 62 wherein said decoding means is operative to combine said results of said sub-tasks by performing a recursive combining process to produce said receive message word M'.

64. A digital signature system as recited in claim 63 wherein said decoding means is operative to perform said recursive combining process in accordance with

$$Y_i \equiv Y_{i-1} + [(M_i'-Y_{i-1})\ (w_i^{-1} \bmod p_i) \bmod p_i] \bullet w_i \bmod n,$$

wherein $2 \leq i \leq k$, and

$$M' = Y_k,\ Y_1 = M_1',\ \text{and}\ w_i = \prod_{j<i} p_j .$$

65. A digital signature system as recited in claim 62 wherein said decoding means is operative combine said results of said sub-tasks by performing a summation process to produce said receive message word M'.

66. A digital signature system as recited in claim 65 wherein said decoding means is operative to perform said summation process accordance with

$$M' \equiv \sum_{i=1}^{k} M_i'(w_i^{-1} \bmod p_i) w_i \bmod n,$$

where

$$w_i = \prod_{j \neq i} p_j .$$

73. A method as recited in claim 17 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

74. A method as recited in claim 17 wherein each of said distinct random prime number has the same number of bits.

75. A cryptographic communications system as recited in claim 22 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

76. A cryptographic communications system as recited in claim 22 wherein each of said distinct random prime number has the same number of bits.

77. A method as recited in claim 27 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

78. A method as recited in claim 27 wherein each of said distinct random prime number has the same number of bits.

79. A cryptographic communications system as recited in claim 32 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

80. A cryptographic communications system as recited in claim 32 wherein each of said distinct random prime number has the same number of bits.

81. A method as recited in claim 37 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

82. A method as recited in claim 37 wherein each of said distinct random prime number has the same number of bits.

83. A cryptographic communications system as recited in claim 42 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

84. A cryptographic communications system as recited in claim 42 wherein each of said distinct random prime number has the same number of bits.

85. A method as recited in claim 47 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

86. A method as recited in claim 47 wherein each of said distinct random prime number has the same number of bits.

87. A digital signature generation system as recited in claim 52 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

88. A digital signature generation system as recited in claim 52 wherein each of said distinct random prime number has the same number of bits.

89. A digital signature process as recited in claim 57 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

90. A digital signature process as recited in claim 57 wherein each of said distinct random prime number has the same number of bits.

91. A digital signature system as recited in claim 62 wherein said step of solving said sub-tasks includes processing each of said sub-tasks by an associated one of a plurality of exponentiator units operating substantially simultaneously.

92. A digital signature system as recited in claim 62 wherein each of said distinct random prime number has the same number of bits.